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TWO-PHASE SEPARATED LIQUID DETERGENT COMPOSITION

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Claims

1. A two-phase separated liquid detergent composition, characterized by containing (A) a surfactant, and (B) a water-soluble macromolecular compound that produces a liquid-liquid phase separation in the presence of the surfactant.

2. The composition described in Claim 1, wherein the water-soluble macromolecular compound is at least one type of substance selected from among polyvinylpyrrolidone, polyacrylamide, water-soluble nylon, hydroxyethylcellulose, hydroxypropylcellulose, cellulose sulfide, hydroxypropylated starch, pullulan, dextran, guar gum derivatives, propylene glycol alginate ester, chitin and chitosan derivatives.

3. The composition described in Claim 1 or Claim 2, wherein the surfactant content is 5-40 wt% and the water-soluble macromolecular compound content is 1-30 wt%.

Detailed explanation of the invention

Industrial application field

The present invention concerns a two-phase separated liquid detergent composition. In addition, the present invention concerns a fashionable two-phase separated liquid detergent composition with a beautiful external appearance and excellent detergent capacity, wherein the separation ratios of the two phases can be freely changed.

Prior technology

In the past, substances that have transparent, emulsion-like, suspension-like, pearly and lustrous or opaque external appearances have been used in shampoos, detergents for dishwashing and laundry detergents. However, so-called separate-phase substances that separate into two phases when left standing have been developed in recent years in order to increase the storage stability of various components and in order to provide a pleasing external appearance.

Examples of these two-phase separated liquid detergent compositions include aqueous phase-hydrophobic liquid phase systems (Japanese Kokai Patent Application No. Sho 54[1979]-24908 and Japanese Kokai Patent Application No. Sho 54[1979]-25906) and aqueous phase-aqueous phase systems (Japanese Kokai Patent Application No. Sho 48[1973]-60112 and Japanese Kokai Patent Application No. Sho 60[1985]-243199).

However, with two-phase separated liquid detergent compositions that are of the former aqueous phase-hydrophobic

phase liquid phase system, although it is possible to change the separation ratio of the two phases, there is the disadvantage that there is no alternative but to sacrifice detergency in order to increase the content of the hydrophobic liquid. In addition, with the two-phase separated liquid detergent compositions that are of the former aqueous phase-aqueous phase liquid system, because the concentration of surfactant is low, the detergency is inferior, and it is difficult to significantly change the separation ratio of the two phases. In addition, there is the disadvantage that phosphorus compounds must be used, which have encountered restricted applications in recent years because of environmental pollution.

Problems to be solved by the invention

The present invention, in light of the disadvantages with the aforementioned types of conventional two-phase separated liquid detergent compositions, has the objective of offering a fashionable two-phase separated liquid detergent composition with a beautiful external appearance and excellent detergency, wherein the separation ratios of the two phases can be freely changed.

Means to solve the problems

The inventors of the present invention carried out repeated and painstaking investigations, and discovered that this objective can be attained when a specific macromolecular compound that produces two separate phases in the presence of a surfactant is blended with a composition containing said surfactant. The present invention was perfected based on this knowledge.

Specifically, the present invention offers a two-phase separated liquid detergent composition, characterized by containing (A) a surfactant and (B) a water-soluble macromolecular compound that produces a liquid-liquid phase separation in the presence of said surfactant.

Examples of the surfactant of the (A) component in the present invention include anionic, amphoteric or nonionic substances, one or more types of which may be used. Examples of anionic surfactants include soaps, N-acylamino acid salts, alkyl ether carboxylic acid salts, acylated peptides and other carboxylic acid salts, alkylsulfonic acid salts, alkylbenzene or alkylnaphthalene sulfonic acid salts, sulfosuccinic acid salts, α-olefin sulfonic acid salts, N-acylsulfonic acid salts, alkylamidosulfonic acid salts, α-sulfo fatty acid esters and other sulfonic acid salts, sulfated oils, alkylsulfuric acid salts, alkyl ether sulfuric acid salts, alkyl aryl ether sulfuric acid salts, alkylamidosulfuric acid salts and other sulfuric acid ester salts, alkylphosphoric acid salts, alkyl ether phosphoric acid salts, alkyl aryl ether phosphoric acid salts and other phosphoric acid ester salts. These substances may be used individually, or 2 or more types may be used in combination.

Examples of amphoteric surfactants include alkylcarboxybetaine, alkylsulfobetaine and other types of alkylbetaine system amphoteric surfactants, alkylaminocarboxylic acid salts, or alkylimidazolinium betaine system and other imidazoline derivative amphoteric surfactants, and phosphoric acid ester amphoteric surfactants. These substances may be used individually, or two or more types may be used in combination. Examples of nonionic surfactants include polyoxyethylene glycols (ester or ether), fatty acid alkanolamides, polyhydric alcohol

fatty acid esters, polyhydric alcohol ester ether mixed types and other types. These substances may be used individually, or two or more types may be used together.

The surfactant content is generally in the range of 5-40 wt% with respect to the composition. If this amount is less than 5 wt%, the detergency will be inadequate, and phase separation will not readily occur. If this amount exceeds 40 wt%, the polymer high-concentration phase that separates will have a tendency to gel, which is undesirable.

In the composition of the present invention, the water-soluble macromolecular compound that is used as the (B) component is a substance that has the characteristic of forming a liquid-liquid phase separation caused by the action of the surfactant (separates into two phases consisting of a dilute solution and concentrated solution of the polymer), and this substance can be selected experimentally by dissolving the substance in a aqueous surfactant solution, and observing the external appearance of the solution. Examples of this type of water-soluble macromolecular compound include polyvinylpyrrolidone, polyacrylamide, modified polyamide water-soluble nylons that can endow substances with a capacity for dissolving in water or alcohol, such as AQ Nylon (product name made by Toray Industries, Inc.), hydroxyethylcellulose, hydroxypropylcellulose, cellulose sulfide, hydroxypropylated starch, pullulan, dextran, dextran carboxymethylated guar gum, hydroxypropylated guar gum and other guar gum derivatives, carboxymethyl etherated chitin, hydroxyalkyl etherated chitin and other chitin derivatives, carboxymethyl etherated chitosan, hydroxyalkyl etherated chitosan and other chitosan derivatives and propylene glycol alginate esters. Of these substances, those substances are preferred which

separate into two distinct phases when allowed to stand, but produce a visually uniform composition when shaken, and examples of these substances include polyvinylpyrrolidone, polyacrylamide, hydroxypropylated starch, water-soluble nylon, pullulan and dextran.

These water-soluble macromolecular compounds may be used individually, or two or more types may be used together in combination. The content of these substances is ordinarily selected to be in the range of 1-30 wt% with respect to said composition. If this amount is less than 1 wt%, phase separation will essentially not occur, whereas if this amount exceeds 30 wt%, the separated phase (concentrated polymer phase) will gel, which is undesirable.

The ratio of the separated phases in the composition of the present invention varies with the concentration and type of surfactant and water-soluble macromolecular compound. In particular, the concentration of the water-soluble macromolecular compound has a significant effect, and can be adjusted over a range of 1-60 vol% within the aforementioned composition range.

Sodium sulfate, magnesium sulfate, sodium chloride and other water-soluble salts, yellow No. 4, yellow No. 5, yellow No. 203, red No. 2, red No. 106, red No. 227, blue No. 205, green No. 3, green No. 204, green No. 401 and other dyes can be added. In addition, auxiliary additives such as solubilizers, BHT, α-tocopherols and other antioxidants, ultraviolet absorbers, protein derivatives, plant extracts, fluorescent whiteners, antimicrobial agents, fragrances and other substances that are commonly used can also be added, depending on the intended use of the composition.

Effect of the invention

The two-phase separated liquid detergent composition of the present invention separates into two distinct phases when allowed to stand, and one phase readily disperses to form microdroplets in the other phase when the container is shaken by hand, thus forming an apparently uniform aqueous solution. In addition, by adding appropriate dyes, the upper or lower phase, or both, can be dyed to form a fashionable substance with a pleasing external appearance. In addition, the detergency of the composition is excellent, and the separation ratio of the two phases can be freely changed. It is also possible to improve these capacities or to produce novel functions by the appropriate selection of the type of water-soluble macromolecular compound added. For example, if polyvinylpyrrolidone is used as the water-soluble macromolecular compound, the composition can be used as a restain inhibitor and the detergency can be improved, whereas if polyacrylamide is used, hair-conditioning effects can be manifested.

Application examples

The present invention is described in additional detail below based on application examples.

Application Example 1

A shampoo composition composed of the blend composition below was prepared.

Polyoxyethylene lauryl ether sodium sulfate (EO 3 mol)	12.0 wt%
Sodium p-toluenesulfonate	3.0
Polyoxyethylene lauryl ether (EO 12 mol)	5.0
Sodium sulfate	2.0
Dye (Red No. 106)	0.0001
Polyacrylamide (polymerization level 10,000)	2.0
Fragrance	0.5
Purified water	balance
[Total]	100%

When this composition was allowed to stand at room temperature, a distinct two-phase separation occurred consisting of an upper phase of a pink transparent aqueous solution in the amount of 75 vol% (low-concentration polyacrylamide phase), and a lower phase of a clear transparent aqueous solution in the amount of 25 vol% (high-concentration polyacrylamide phase).

In addition, the composition readily formed a uniform solution when shaken (the lower phase dispersed in the upper phase in the form of microdroplets with a size of 1-20 μm). When used as a shampoo in this configuration, the composition had good detergency, and also left hair feeling more supple than with blends that did not contain polyacrylamide.

Application Example 2

A shampoo composition composed of the blended composition indicated below was prepared.

C_{12}-C_{16} α-olefin sodium sulfonate	5.0 wt%
Sodium lauryl sulfate	5.0
Coconut oil fatty acid diethanolamide	4.0
Magnesium sulfate	2.0
Dye (Green No. 2)	0.0005
Dye (Yellow No. 203)	0.001
Hydroxypropylated starch	19.5
Polyacrylamide	0.5
Fragrance	0.5
Purified water	balance
[Total]	100%

When this composition was allowed to stand at room temperature, a distinct two-phase separation occurred consisting of an upper phase of a green transparent aqueous solution in the amount of 50 vol% (low-concentration polyacrylamide phase), and a lower phase of a yellow transparent aqueous solution in the amount of 50 vol% (high-concentration polyacrylamide phase).

In addition, the composition readily formed an apparently uniform solution when shaken (the lower phase dispersed in the upper phase in the form of microdroplets with a size of 5-80 μm). When used as a shampoo, the composition had good detergency, and also left hair supple.

Application Example 3

A laundry detergent composition was prepared composed of the blend composition indicated below.

Polyoxyethylene lauryl ether sodium sulfate (EO 3 mol)	5 wt%
Polyoxyethylene lauryl ether (EO 12 mol)	10
C_{12}-C_{18} α-Olefin sodium sulfonate	15
p-Toluene sodium sulfonate	3.0
Polyvinylpyrrolidone	1.5
Hydroxypropylated starch	3.5
Dye (blue No. 205)	0.003
Fragrance	0.2
Fluorescent whitener	0.2
Water	balance
[Total]	100

When this composition was allowed to stand at room temperature, a distinct two-phase separation occurred consisting of an upper phase of a blue transparent aqueous solution in the amount of 70 vol% (low-concentration polyacrylamide phase), and a lower phase of a light-blue-transparent aqueous solution in the amount of 30 vol% (high-concentration polyacrylamide phase).

In addition, the composition readily formed an apparently uniform solution when shaken (the lower phase dispersed in the upper phase in the form of microdroplets with a size of 5-50 μm). When 40 mL of this solution were placed in a washing machine (30 L) and 1.5 kg of cotton undergarments that had been soiled were washed, the same level of detergency as with commercially available detergents was produced.